Vol. 13.] 1942. [No. 4.

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AGRICULTURAL JOURNAL

Issued by the
Department of Agriculture, Fiji.

PRICE, ONE SHILLING.

BY AUTHORITY: F. W. SMITH, GOVERNMENT PRINTER, SUVA.
1942.

FORMER ISSUES OF AGRICULTURAL JOURNAL.

NOTES FOR LIBRARIES AND RESEARCH INSTITUTES.

So many requests are received from abroad for parts of the *Agricultural Journal* which were never published that the following list of all issues is given for reference. Attention is directed especially to Volume VII which had only one part:—

Vol.			*Vol.*		
I	3 numbers,	1928	VIII	4 numbers,	1935–7
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ISSUES OF THE AGRICULTURAL CIRCULAR.

The following were the numbers and year of issue of the *Circular*:—

Vol. 1, 1920, 12 numbers.
,, 2, 1921, 5 ,,
,, 3, 1922, 4 ,,
Vol. 4, 1923, 1 number.
,, 5, 1924–5, 2 numbers.

As number 4 of Vol. 3 was printed as "Volume 4" and number 1 of Vol. 4 as "Volume 5" it would appear from an inspection of a complete set that Volume 4 comprised only a number 4 and that there were two issues of Volume 5, Part 1.

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3. Rhinoceros Beetle in Samoa, 1912.
4. The Banana in Fiji, 1912.
5. Scale Insect on Bananas, 1913.
6. Lemon Grass, 1913.
7. A Mission to Java for a Coleopterous Pest of Bananas, 1914.
8. Coconut Experiments, 1915.
9. Soils of Fiji—I., 1916.
10. Fijian Plant Names, 1918.
11. Alluvial Soils of Fiji, 1919.
12. Leaf Moth of Coconuts, 1919.
13. Sea Island Cotton, 1920.
14. Transparent Coconut Scale, 1921.
15. Purple Leaf Moth of Coconuts, 1924.
17. Early Nutfall in Coconuts, 1930.
18. Control of Coconut Spike Moth, 1935.
19. Fruit Fly Investigations, 1936.
21. Biological Control of the Rhinoceros Beetle, 1941. Price 1s.
    Fijian Plant Names, 1942. 3s. 6d., 4s. and 6s.

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—EDITOR.

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AGRICULTURAL JOURNAL

ISSUED BY THE
DEPARTMENT OF AGRICULTURE, FIJI.

VOL. 13.] DECEMBER, 1942. [No. 4.

EDITORIAL.

THIS issue begins with the 1941 annual report of the Department of Agriculture which has, of course, been much abbreviated. It should, however, prove of interest and serve to indicate the useful work carried out during the year.

A brief progress report on the proposed rice scheme in the Toga area of Rewa indicates that endeavours are being made to carry out the dictates of the Secretary of State that it is necessary to aim at a greater measure of self-sufficiency in regard to staple food crops. The report shows that rice land has already been made available at a trifling cost to 199 families who previously had no land suitable for rice production and this in itself is commendable and indicates that there is a definite demand for rice land in that thickly settled neighbourhood.

A short note dealing with local food production is included in this issue and fairly portrays the efforts being made to augment general production to satisfy immediate requirements.

The increase in the cultivation of vegetables has inevitably resulted in a corresponding increase in their insect pests now provided with a great variety of extra food. The article on the chief pests of vegetable gardens with measures for their control deals with this important subject and is largely an expansion of an article which appeared over three years ago with details of other insects which have since reached pest proportions.

With the war brought as near to us as the Solomons, with one officially reported outburst in the New Hebrides only 800 miles from Suva, we are naturally concerned with the possible entry of the malarial mosquito. To give some facts about the only Anopheline in Melanesia, the Entomologist devotes an article which shows how suitable Fiji would be to its spread were it ever to gain access to these islands. The very recent entry of this pest into two outlying islands of the Solomon Islands which were previously free, disposes of the impression, so popular in so many places, that any island which was suitable for these mosquitoes would already have them.

Under copra shipments a synopsis is given of sales under this new scheme of purchase whereby the Ministry of Food is the sole purchaser of exported copra. This should interest copra producers who are informed that any surplus funds accruing to the Copra Board will be utilized to improve prices to growers from time to time or conversely any debit balances will be made up by a decrease in price of the product.

A new type of article for this *Journal* is a survey of Indian farmers in Ba, Tavua and Ra from which certain facts emerge. Thus over half the holdings are not greater than 10 acres, the area under cultivation increases disproportionately to the size of the farm and the area under rice and pulses is less per head in 10 acre holdings than in larger ones. Both pigeon pea and pulses are much more common in Ba and Tavua than in Ra but all sub-districts had very small plantings of tapioca and kumala.

ANNUAL REPORT FOR THE YEAR 1941.

By
Dr. H. W. JACK, O.B.E., B.A., D.Sc., M.L.C.

SECTION I—GENERAL AGRICULTURAL CONDITIONS.

The most severe hurricane for 30 years was experienced in February. Structural damage was severe in Suva, and in townships and villages over a wide area in Eastern Viti Levu particularly, and the consequent necessity for rebuilding native houses constituted a drain on Fijian and Indian resources of time and labour. There were later hurricanes mainly restricted to the eastern parts of the group where considerable loss of coconuts, both in palms and crop, was experienced. The banana industry suffered almost total eclipse for several months. All agricultural industries suffered to greater or less extent, but fortunately the hurricane was not accompanied by heavy floods and the setback to food production, though serious in some localities, was fortunately not anywhere calamitous.

2. Locally there were long dry periods, with exceptionally heavy rain in May. Towards the end of the year the lack of rain caused concern for the newly planted rice crop which is entirely dependent on rainfall.

Principal Export Crops.

Sugar.

3. Weather conditions were, on the whole, unfavourable but extra plantings in 1940 resulted in a large crop which could not all be manufactured, and the sugar out-turn was far below normal. The acreage harvested was 43,739 acres and the crop 835,603 tons of cane. The export of sugar from July 1940 to June 1941 was 109,431 tons. There were reduced plantings for the 1942 season. Experimentation had, unfortunately, to be curtailed. Cane farmers were encouraged to contribute to the total food production of the Colony by plantings of dry-land food crops on cane fallows, including upland rice.

Copra.

4. Considerable loss of crop, and of palms in restricted localities, occurred as the result of hurricanes or blows. Much immature "rubbery" copra resulted from the collection of fallen nuts and was responsible for the low grading of copra for several months following the storms. The industry suffered from the low prices prevailing during the first six months of the year particularly; some estates were forced to close down, and the work of upkeep on all was limited to bare maintenance. Native areas also were neglected and only sufficient copra manufactured to provide for bare necessities while many Fijians sought employment outside the copra districts. Exports amounted to 14,918 tons only. Prices rose progressively from a flat rate of £3 10s. per ton early in the year to £6 10s. and £5 10s. for Plantation and F.M.S. grades respectively in November. This followed the commendable enterprise of a company with local association who established a large crushing plant in Canada, and thus assured the Colony of an outlet for all copra of reasonable quality at a price somewhat higher than that offered by alternative markets.

5. Copra grading on a voluntary basis was established to meet the requirements of the new Canadian Mill, and approximately 1,900 tons of Plantation grade was certified during the six months of the year that the system was in operation.

6. Negotiations with the Governments of the Commonwealth of Australia and the Dominion of New Zealand on the basis agreed upon at the Sydney Conference were continued for the greater part of the year. Before these came to fruition the entry of Japan into the war altered the world copra situation which entered upon a new phase of competitive demand.

Bananas.

7. The year was most unprofitable for growers and exporters as the February hurricane caused great loss of fruit and permanent damage to plants. The upper Wainibuka and Kadavu areas escaped comparatively lightly and maintained their production, but elsewhere there was no packing for several months. By the end of the year recovery to normal production was almost complete.

8. Total exports, all to New Zealand, were 40,740 cases, including 3,039 cases of second grade fruit. By areas, 67 per cent was grown in Viti Levu, 17 per cent in Kadavu, 8 per cent in Lomaiviti, 7 per cent in Vanua Levu and 1 per cent in Beqa. 98 per cent was grown by Fijians, 1·3 per cent by Chinese and only 0·5 per cent by Indians and Europeans together.

9. The price remained at 9s. 4½d. for first grade and 8s. 8½d. for second grade, f.o.b. Suva, of which the grower received 4s. in the Viti Levu districts and Ovalau, and 3s. elsewhere. Costs, particularly of the exporters, continued to rise.

CITRUS AND OTHER EXPORT FRUITS AND VEGETABLES.

10. The citrus crop was an almost complete loss due to the hurricane and there was no export. There was a small export of 1,082 cases of fresh pineapples but no kumalas, pumpkins, melons, tomatoes or cucumbers.

Pineapples.

11. Weather conditions were generally favourable to this crop. Indian growers in the western districts and Fijian growers on Ovalau became increasingly interested; but although sales difficulties were removed later in the year, it seems unfortunately probable that shortages of canning equipment may require reductions in planting.

Cotton.

12. The 1940–41 crop was purchased by Government at 3d. per pound of seed cotton and amounted to 57,482 lb of which 42,782 lb were grown in Viti Levu and 14,780 lb in Vanua Levu. No seed was issued for further plantings and the industry has been temporarily suspended.

Maize.

13. There were considerably increased plantings following the stimulus given by the New Zealand purchase of one ton early in the year. Notification was later received that maize was no longer required by New Zealand, but local consumption in the Colony increased so considerably that an anticipated surplus did not eventuate. In addition to increased demand for poultry feeding, the substitution of maize flour for sharps by the rural Indian population is gaining rapid ground, due to successive rises in price of the later.

Tapa.

14. Interest has been shown in the dried inner bark of " masi " (the Tapa plant) for export, and an Agricultural Officer visited Lau to investigate the economics of production. A drive to increase production in the then depressed copra districts was undertaken but the rise in the price of copra late in the year is likely to discourage further plantings of " masi ".

Food crops.

15. Propaganda for the further production of food crops and the maintenance of a reserve of food in the ground—since climatic conditions and the nature of the staple crops are not conducive to other forms of storage—was maintained. A considerable strain on the Colony's transportable fresh food supply has resulted from the concentration of military and defence labour forces in certain localities. The strain is being met, but prices have risen. The Indian farming population has made a praiseworthy effort to overcome the short production of rice but is, however, responding too slowly to exhortations to insure against possible failure of the local rice crop or of imported supplies of rice, sharps and flour by regular plantings of native root crops. Plantings of maize and pulses have increased and also of peanuts, but endeavours to extend the production of potatoes outside the Sigatoka area have not met with success. The production of the commoner types of European vegetables has very greatly increased, mainly for sale to the military.

SECTION II—WORK OF THE DEPARTMENT.

Experiment Stations and Demonstration Farms.

16. No new experimental work was initiated at any of the three stations, but experiments and demonstrations in progress here, and at the several substations, were maintained so far as possible. Little development has taken place owing to the preoccupation of the staff with increased production and other duties. Food plantings on farms have been increased and a small but useful rice irrigation scheme was developed on one farm. Poultry was extended at Nasinu, where production of Australorp breeding stock is still unable to satisfy demand. The citrus nurseries were also extended and new paddocks opened for an increased dairy herd. At Naduruloulou banana work received a setback due to hurricane damage, but very useful work with rice varieties, dalo varieties and soya bean was carried on, and also the development of the " model farm ". At Sigatoka work was mainly limited to the consolidation of development undertaken during the previous two years.

17. At all stations student training in practical agriculture was maintained, 51 Fijians being under instruction. At Sigatoka training was extended to Indian youths also, for the first time, and four were in residence.

18. The supervision of five provincial training farms for Fijians was also continued, embracing some seventy pupils.

Extension Work.

19. General assistance continued to be given to Fijian and Indian farmers, but the field staff was mainly occupied in stimulating the production of food crops in increasing quantities for the military and for labour camps. Existing Fijian settlements were maintained and assisted in some further development and in marketing. Settlements mainly for Indian rice growers were pushed

ahead in Toga (Rewa) and in Vanua Levu. A communal effort to irrigate a large block of Indian and Fijian lands in Tailevu was stimulated with considerable success.

20. Approximately 35 tons of padi seed, partly purchased and partly grown on Departmental stations, was distributed at cost, mainly to Colonial Sugar Refining Company tenants, in an effort to render the Colony self-supporting in rice.

Produce Inspection and Marketing.

21. All incoming and outgoing fresh produce and planting materials of vegetable origin were inspected in accordance with routine practice.

22. Exports of fresh produce consisted of 40,740 cases of bananas and 1,082 cases of pineapples, with inconsiderable quantities of green ginger, citrus, dalo, arrowroot, yams, papayas, Mauritius beans and coconuts.

23. Fresh vegetables and fruit supplies handled in Suva and Nausori for military amounted to 1,534,687 lb valued at £10,296 and in the Western Districts approximately 150,000 lb valued at £1,000. Of the total amount, 49 per cent was supplied by Fijians and the remainder by Chinese growers principally and others. These large quantities of produce have all to be collected from innumerable small farmers and the work entailed on the part of the Agricultural Officers, South and West particularly, and the Produce Inspector, and their Fijian and Indian staffs, is deserving of the highest commendation.

Chemical Activities.

24. The Chemical Division received 1,010 samples for analyses and performed over 3,000 separate determinations. The number of analyses constitutes a record for the laboratory despite absence of staff on war work. The samples included minerals, ores, milks, liquors, foodstuffs, drugs, fertilizers, soils, waters, oils, pastures and general forensic materials. Much advice was given to the military on numerous subjects and expert evidence was tendered in the courts including the first ballistics case in Fiji.

Entomology.

Green Vegetable Bug.

25. *Nezara viridula* L. was found to have extended its range from Viti Levu and Vanua Levu to Taveuni and Rabi. In March a colony of the egg parasite *Microphanurus basalis* Woll. was kindly sent by the Government Entomologist, New South Wales, and 11,000 individuals were liberated locally in the remaining nine months of the year, and 350 sent to Tonga, one consignment going by plane.

Quarantine.

26. Owing to the recent arrival of the cabbage white butterfly (*Pieris rapæ* L.) in Australia it was decided to prohibit the importation into the Colony of crucifers from that country.

27. Cuttings, orchids, fruits, flowers and nuts from the British Solomon Islands, New Caledonia, Gilbert Islands and Rotuma were examined for insect pests and a new scale insect was intercepted on a young fig tree from the Gilberts. Seed cotton from the New Hebrides was also examined but only *Oryzæphilus* and *Tribolium* were present; both of these beetles occur already in Fiji. Book lice (Pscoptera) were found in some pressed flowers sent through the post from India.

Beneficial Insects.

28. The breeding and liberation of the Indian fruit fly parasite *Dirhinus* was continued by the Native Laboratory Attendants and a total of nearly 42,000 was released compared with 34,350 in 1940. A colony of the lantana bug *Teleonemia scrupulosa* Stal. was sent to Lodoni and *Liothrips urichi* Karney to Gau for control of *Clidemia hirta*.

VETERINARY DIVISION.

29. All stock raising areas were inspected by Veterinary Officers or Stock Inspectors, though not as fully as in previous years.

30. Under the Stock Improvement Ordinance the following animals were dealt with:—

Bulls—		Stallions—	
Licensed	130	Licensed	17
Ordered to be castrated ..	199	Ordered to be castrated ..	73
Castrated by staff	124	Castrated by staff	57

31. The following animals were imported into the Colony:—

Cattle	10	Dogs	4
Horses	2	Cats	3
Sheep	58	Poultry	126
Pigs	3	Birds	4

32. No disease was found in any of these animals. All importers complied with the regulations and most of the animals were for breeding purposes.

33. Under the Animal (Contagious Diseases) Ordinance the following tuberculin tests were carried out and positive reactors disposed of:—

	Number tested.	Positive reactors.	Per cent infected.
Cows in registered dairies, Suva, supplying milk to the Municipality ..	979	19	1·94
Total tests carried out in the Colony	3,824	745	19·48

33. The scheme for the testing of all cattle in registered dairies by the tuberculin test was extended to include one more important area.

34. Contagious abortion continues to be enzootic in a few well defined areas but there has been no increase in the incidence. The Agglutination test was carried out on blood serum from 568 cattle from the above areas and 138 or 24·5 per cent were positive.

35. Bacillary White Diarrhoea of poultry continues to be found in infected flocks. The Agglutination test was performed on 3,386 occasions. Of these tests 300 were positive.

36. Under the Animal (Contagious Diseases) Ordinance the following animals were destroyed:—

Tuberculosis, 82; Actinomycosis, 3; Bacillary White Diarrhoea, 300; Cancer, 20.

37. Some pig-raising areas are still badly affected with Stephanuriasis. Where concrete floored pig-styes have been erected, however, this disease and intestinal parasites in general, have been practically eliminated.

38. In the Clinic and Hospital, Suva, 696 cases were dealt with and in Nadi, 181 cases were treated making a total of 877.

39. Agglutination tests in the Pathological Laboratory amounted to 568 while 25 pathological and bacteriological tests were made.

Dairying.

40. The industry experienced a good year, figures for production being as follows:—

Butter fat purchased	579,132 lb
Butter made	701,519 lb
Ghee made	32,624 lb

These figures do not include farm-produced ghee.

Production.

41. The production of pigs is still increasing. Increased local demand for good quality pork has resulted in breeders improving their breeding stock.

42. The Colony was able to supply all demands for beef for local consumption. During the year an order was brought in under Regulation 50 of the Defence Regulations, prohibiting without permission, the slaugh er of cows under eight years old and of all other bovine animals under three years old, and the speying of all cows, the object being to conserve the cattle population.

43. The demand for both eggs and poultry was greatly in excess of supply and the Department continued its policy of fostering the industry by the production for sale to poultry farmers of pure stock from Nasinu and Sigatoka Experimental Stations.

44. During the year 1,058 cattle brands were registered. The total number of brands now registered in the Colony is 1,426. The value of this to all concerned is undoubted.

45. Seven thousand seven hundred and nine cattle, 158 sheep and 2,311 pigs were slaughtered for food during the year.

46. The following animal products were exported—8,829 hides weighing 394,394 lb of £5,523 in value and 20,732 lb weight of horns, hoofs and bones valued at £46.

47. An animal census was made and showed the following results:—Horses 16,000, Cattle 84,000, Pigs 8,500, Sheep 365, Goats 27,000, Fowls 110,000, Ducks 6,500, Turkeys 1,000, Geese 350. These figures indicate a material increase in cattle, pigs (domesticated), poultry and horses compared with 1940.

Conclusion.

48. I desire to place on record my sincere appreciation of the loyal and energetic service rendered by all members of the Staff including Europeans, Fijians and Indians, throughout a difficult year.

EXTRACT.

1. TEA LEAVES.

It is pointed out that spent tea leaves have some nutritive value and might be used for the partial feeding of animals. An average sample of spent tea leaves contains 84·2 per cent of water and 15·8 per cent of dry matter which on analysis was found to contain 26·1 per cent of crude protein, 14·2 per cent of fibre, 1·2 per cent of oil and 4·6 per cent of mineral matter, so that broadly speaking, tea leaves may be regarded as a rough substitute for bran though rather higher in fibre and lower in digestible protein. Experiments with rabbits indicated that 12·5 per cent of concentrates could be replaced by spent tea leaves. —H.W.J.

Nature—No. 3798, 15 August, 1942.

TOCA RICE SCHEME—PROGRESS REPORT.

By
H. W. JACK, O.B.E., B.A., D.Sc.,
Director of Agriculture.

In accordance with the instructions of the Secretary of State to secure an immediate increase in rice production and in order to assist in meeting the demand for rice land amongst the thickly populated Indian settlement around Nasinu, the Toga area of some 2,000 acres of flat land was chosen as having useful potentialities, provided that drainage was practicable.

Entry to the area was secured only in November 1940 when preparations for the rice season should have been well under way. Despite the lateness of the start, the heavy clearing work, severe damage to nurseries by wild cattle and lack of road access, 73 tenants were able to plant 117 acres of rice in the 1940–41 season which gave fair crops. The planted lands were confined to the fringes of the area. In order to control the movements of stock approximately 120 chains of wire fencing was erected.

During 1941 access to various sectors was facilitated by the provision of a light pontoon across the Wainibuka creek, the cleaning of the track from the King's Road to the pontoon and the construction of a raised track over swampy ground from the pontoon to the Rewa pipeline. Later in the year the construction of two new tracks roughly parallel to the pipeline became necessary owing to damage to the latter by the passage of working stock. Access to the Sauniwaqa sector has been provided by $1\frac{1}{4}$ miles of motor road of which half has been metalled, while 24 chains of track are under construction.

In the same sector, 58 chains of drain (6 by 4 feet) were dug to a creek and 16 chains of creek were cleared to facilitate the flow of water.

In 1941–42 season 193 tenants held 551 acres of which 230 were planted with rice and despite a very adverse rice season fair crops were again harvested, estimated at some 180 tons of padi.

Thus, in two years, despite the intensive demand for labour for defence purposes and the consequent loss of many prospective tenants, the crop from some 230 acres of padi has been added to the locally grown food supply during a critical period at a trifling cost to Government and the effect is likely to prove cumulative.

The expenditure to date (30/9/42) has aggregated £860 of which £400 was spent on an entrance road which, incidentally, gives access to a large number of residential holdings in the neighbourhood on which material quantities of food crops are now grown—the road has greatly enhanced the value of these holdings and all the Wainibuka Government Indian Settlement holdings adjacent to the rice area are now occupied.

Owing to military demand for road metal it was not possible to complete the metalling of the road this year but it is hoped to complete it—25 chains—next year.

Other items of expenditure included:—

(*a*) a sirdar to assist generally in laying out the area and in organizing Indian labour for the work undertaken;
(*b*) the provision of a pontoon to give access across the Wainibuka Creek;
(*c*) cutting and building up and draining entrance tracks into the area;
(*d*) digging exploratory drains to assist in observations of the natural flow of surplus water;
(*e*) the erection of a tool shed;

(*f*) the provision of a barbed wire fence to protect the area from the depredations of wild cattle;
(*g*) tools and incidentals.

The work done is all of an exploratory nature pending the availability of a surveyor to make a proper survey of the whole area without which it is not possible to assess the potentialities of the area or to draw up any concrete scheme of planned development.

It will be admitted however that the little assistance already given to settlers has been well worth while and that padi has been grown by a substantial number of settlers to whom previously no padi land was available and in addition considerable quantities of other foods have been grown by the settlers including maize, tapioca, kumalas, dalo, chillies, beans and other vegetables, bananas, poultry, etc.

Pending the survey of the area it is not possible to assess with certainty the possibilities of development and hence up to the present the rent charged to tenants is 5s. per acre and development work is limited to access to the fringes of the area, construction of tracks and exploratory drains to confirm observations as to the natural flow of surplus water.

Though the area, like the whole of Rewa, is subject to floods from time to time, these are more likely to occur before the main rice planting period. Such periodic floods are, of course, detrimental to all crops in Rewa including sugar and rice but on the whole it is considered that parts at least of the area will prove sufficiently drainable for rice cultivation when a survey can be made.

In any case, floods in Rewa have rarely been unduly detrimental to the rice crop and as there is a distinct demand for rice land in the vicinity, the possibilities of establishing a rice scheme merit sympathetic and practical consideration especially in view of the immediate need for more rice at the present time.

The work involved in organizing and planning this potential rice area was started by Mr. D. A. Donald and continued for the last year by Mr. L. W. Harwood. These two Agricultural Officers have done excellent work, ably assisted by their Indian Assistant Bunsi, and I would record my appreciation of their strenous efforts.

LOCAL FOOD PRODUCTION.

By
Dr. H. W. JACK, O.B.E., B.A., D.Sc., M.L.C.

DESPITE the many other calls on labour, food production is of primary importance at the present time. It is essential that a regular succession of food plantings should be maintained so as to provide an ample, varied and continuous supply of foodstuffs for the people of the Colony and thus to assist in reducing the use of ships for bringing us food from overseas, all available shipping space being required for war purposes.

Abundant supplies of fresh vegetables and fruit are also required in order that our troops may be kept fighting fit, hence much thought and effort has been put into plans for the organisation of increased supplies of civilian foodstuffs and foods required for Fijian and other armed forces.

Through administrative channels, propaganda, co-operation with the Colonial Sugar Refining Company and other means, substantial progress has been made in the production of local food crops and though some crops may temporarily be in short supply, e.g. dalo in December and January, on the whole there are abundant crops in the ground at present.

Less than usual of the past rice season's crop has come on the market as producers are evidently holding to assure their own family supplies for the year and it is anticipated that in the coming season a special effort will be made, especially by the Indian community, to plant additional areas of rice.

In this connection, a material increase in rice production is expected in the Labasa area where the Agricultural Officer Northern has performed useful work in placing 80 Indian families on land on which they can grow rice; similarly in the Toga area near Suva access and drainage facilities have been much improved by the local Agricultural Officer and holdings have now been allotted to 199 Indian families.

The burden of the important work of providing vegetables and fruit for the Forces has been carried by Agricultural Officers, the Produce Inspector and Field Assistants of the Department of Agriculture and without their staunch and vigorous efforts the satisfactory results attained to date would not have been possible. It may be mentioned that the native market at Nausori supplies about £1,500 worth of produce monthly to the armed forces and labour camps.

During the past six months, despite unfavourable weather conditions, over 3,500,000 lb of vegetables and fruit have been provided for the armed forces through the Department of Agriculture at an average cost of 2d. per lb.

This result has been mainly due to the combined efforts of Chinese, registered Fijian growers, particularly in the Rewa, Sigatoka and Wainibuka river areas, and latterly by Indians. Their ready co-operation and the continued assistance rendered by the military staffs, especially in the matter of transport, are much appreciated.

Plans for doubling the above rate of production of necessary fresh food supplies for the army in the next few months are in progress and prospects of achievement are reasonably good provided that registered Fijian growers are permitted to continue to produce surplus crops on their lands, that additional crops are grown by Indians (who are now showing more interest in this vital work) and that seasonal conditions are moderately favourable.

Assistance has been given to registered growers by the provision of seeds, kindly supplied by the Forces, the loan of tillage implements and sprayers, advances to purchase implements and working stock, guarantee of purchase of crops at fixed remunerative prices, the establishment of collecting centres, the provision of land on temporary conditions and with the transport of produce, etc.

In addition, an Order under the Defence Regulations has been issued, under which all smallholders of land, including sugar cane growers, must plant monthly half a square chain of some useful food crop in order to secure a continuous succession of food crops for family requirements and in the hope that some surplus will also be available for sale. Alternatively, or in addition, at least one acre of rice must be planted by all those to whom suitable land is available. It is hoped that the rural community will co-operate freely in making a genuine effort to produce as much of their own food as possible.

Depredations of vegetables by insect pests in Chinese and other vegetable gardens have been severe during the last few months, resulting in some cases in loss of 50 per cent of the crops.

In consequence, the Entomologist and his Native Assistants have visited the main Chinese vegetable gardens and demonstrated control measures. They have also assisted by provision of sprayers and insecticides, leaflets printed in Chinese, routine visits to accessible gardens, etc., and by these means it is hoped that losses due to pests will be reduced to the minimum.

The Veterinary staff of the Department of Agriculture has strained every effort to assist in the increase of livestock, especially pigs and poultry, utilising waste food from camps, and though production has increased, it is still insufficient to meet the present demands.

Beef and butter consumption have greatly increased in the last six months, largely due to increases in armed forces, including Fijians, and the greatly increased spending power of the native labourer and his family. Rationing of butter became necessary for a short time in order to counteract over-consumption.

In endeavours to utilise some of the waste food from army camps a small herd of pigs has been fattened during the last nine months with satisfactory results providing a useful demonstration.

In his speech to the Legislative Council on 19th August, His Excellency the Governor stressed the national importance of farming and urged the necessity for the maximum possible production of food crops " so that not one ton of shipping nor the life of one sailor shall needlessly be imperilled to bring to us the necessities of life."

It is therefore hoped that some sacrifice will be made by all so as to attain this objective.

PESTS OF THE VEGETABLE GARDEN AND THEIR CONTROL.

By

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Now that the " grow more food " campaign is more of a necessity than a luxury with a consequent increase in the land under vegetables and of allotment gardens, the reprinting of an article which appeared in this *Journal* in March 1939 seems desirable. Certain additions and corrections have been made as a result of more work on this subject. Care must be taken that the increased use of arsenicals does not result in poisoning to children or domestic animals.

Many people keen on gardening, and also those who grow vegetables and salad plants simply for the table, often find their crops attacked by various insects. In this article an attempt has been made to give some hints on control for the more common of such pests as have been seen by the writer during the last five years.

For easy reference, the pests are grouped according to their type or kind, briefly described with their favourite host-plant and general control measures then given for each division. The size of the pest is sometimes given in millimetres, of which 25 equal approximately one inch.

1. " CUTWORM " CATERPILLARS.

Prodenia litura F., and *Heliothis armigera* (Hbn.)—These are usually olive-green to brown caterpillar pests of cabbage, carrot and tomato, generally found feeding by night about ground-level. A poison bran bait is made by mixing 5 lb of bran or sawdust, ¼lb of white arsenic or Paris green and 3lb of sugar (or 1 pint of molasses) in 1 gallon of water. First stir the poison very intimately with the bran, mix the sugar or molasses with the water and slowly stir it into the now poisoned bran mixture. Scatter in handfuls every few yards amongst the crop applying it not before 5 p.m. and seeing that poultry or pigs do not obtain access to it. The amount given should suffice for ¼ acre.

2. OTHER CATERPILLARS.

As it is virtually impossible for anyone but a specialist writing for specialists to give descriptions which would serve to identify the various caterpillars, it is desirable instead to list briefly the adult moths into which they develop. A certain sameness is inevitable but this method seems best for identification, reference and completeness.

Plutella maculipennis (Curt.), a dark-brown and yellow moth, wing span of 16 mm. Leaves of cabbage are eaten by the green caterpillars which may attack the heart and completely spoil the plant for human consumption. The cocoon is a very open net-work.

Crocidolomia binotalis Zell., a cream-coloured moth with brown markings, measuring 23 to 25 mm. across the forewings. Cabbage leaves eaten by a green caterpillar with pale longitudinal stripes.

Hellula undalis F.—This moth is only 15 mm. across with brown marblings on a tawny background. Also on cabbages, into the heart of which the larva bores.

Heliothis armigera (Hbn.) —This voracious feeder attacks tomato fruits, maize kernels, pea and dhall pods besides feeding as a cutworm on Para grass. The caterpillar is greenish brown with dark longitudinal stripes and the moth is fawn-coloured with a dark band on the hind wing and a span of $1\frac{1}{2}$ inches.

Margaronia indica Saund.—This distinctively-marked moth has a central white area on the wings with a wide border of dark brown. Its span is 27 mm. and its usual food-plants as a caterpillar are cucumber and pumpkins.

Nacoleia diemenalis Guen.—This small orange-brown moth varies in span from $\frac{3}{5}$ to $\frac{1}{3}$ of an inch and has a black network on the wings. The caterpillar is a leaf-roller of beans (*Phaseolus* spp.) and injures the leaf surface.

Dræcenura pelochra Meyr.—A cream-coloured moth with two brown undulating lines and spots: it measures 22 mm. across the wings and is common on Taveuni on beans whose young shoots it severely damages.

Mocis trifasciata Steph.—One of the largest moths dealt with being $1\frac{1}{2}$ inches across the brown forewings which are marked with a dark, irregular blotch; the hindwings have three dark bars as the name implies The larva eats bean leaves on both Viti Levu and Taveuni.

Maruca testulalis Geyer.—Like the preceding, this is a nocturnal moth flying around growing cowpea and bean plants. The forewings are brown with a white or silver key-hole mark, while the hind wings are white with a brown outer margin. It measures the same as *Dræcenura*, say seven-eighths of an inch. The caterpillar travels through the pods; it is greenish-yellow with black spots.

Cryptophlebia illepida Butl.—Usually an ivi (*Inocarpus*) pest, but it also occurs on Mauritius beans. Has at least three parasites, two "wasps" and one fly.

Zizera labradus Godt. *mangœnsis* Butl. is a small blue butterfly measuring 25 mm. with a squat and slug-like caterpillar. Another bean pest, but on the flowers, not the leaves.

Hymenia recurvalis F.—The cream-coloured caterpillar of this moth is known only too well to beet growers though *Amaranthus* is also attacked. The adult is brown with two large white areas on the forewing and one on the hind: its span is 20 mm.

Hippotion celerio L.—The caterpillar of the sweet potato hawkmoth is recognized by its terminal spine and has been controlled with arsentical sprays or dusts.

Prodenia litura F.—The caterpillar of this variegated brown moth with a wing span of $1\frac{1}{2}$ inches attacks a large variety of crops including cabbage, lettuce, carrot, bean, dalo, tomato and maize. See also under 1, "Cutworms" above.

Sylepta derogata F.—The predominant colours of this moth are pale orange with a brown network. It has a wing span up to 30 mm. and its green larva eats leaves of *Hibiscus esculentus*, (bele, okra or bindi).

Control.—For all the above caterpillars where only a few plants are attacked and the area is small it is usually possible to have labourers' mosquito netting run over a light framework of sticks. In cases where this is not possible the best treatment is dusting with pyrethrum powder mixed with three or four times its volume of wood ashes or flour. This insecticide is made from the dried flowers of chrysanthemums and rapidly loses its efficacy if not kept well stoppered and dry. Particular attention should be devoted to this point especially in the wet season with its higher humidity (over 85 per cent): it will be found a worth-while practice to keep the bottle or tin, when not in use, in the kitchen or copra drier. Derris is also useful when available.

If a stronger and more poisonous insecticide is required, the following sprays are recommended but should not be used for edible leaves less than fourteen to twenty-one days before gathering them. Outer leaves to be discarded.

2 oz. of lead arsenate powder *or* 4 oz. of lead arsenate paste dissolved in six gallons of water. Stir well before and during application so as to avoid the application of too much solid matter over a small area of leaf surface. Calcium arsenate powder is cheaper but is more poisonous and liable to scorch foliage. Use only 1 oz. mixed with 3 oz. of slaked lime in 4 gallons of water.

3. BEETLES

Cucumber and pumpkin leaves are usually damaged by a larger (8 mm.) beetle, orange above and black below and a smaller one (5 mm.), yellow with four square black spots. These insects are respectively *Aulacophora coffeæ* Hornst. and *A. quadrimaculata* F. and are popularly but erroneously called lady-birds which are always nearly circular in outline with a retracted head. Pyrethrum, one part to 3 or 4 of flour or wood ashes, or calcium arsenate for control.

With cucumber, marrow, tomato, egg-plant, potato and Cape gooseberry (*Physalis peruviana* L.) one often finds the leaves reduced to a skeleton. The damage is done by a yellow ladybird with many black spots, measuring 6 mm. in length and known as *Epilachna* 28-*punctata* F.—apparently our only harmful ladybird.

Control.—All these beetles can be combated with fortnightly lead or calcium arsenate sprays as explained above for caterpillars. Various other ladybirds are likely to be present in gardens but they are beneficial as their grubs eat scale insects, mealy bugs and aphis. Bordeaux mixture, as detailed under slugs, can also be used. Lime and tobacco dust in equal parts is a good protective powder and this applies to derris with talc or flour.

4. SUCKING BUGS.

The insects described so far have all had one thing in common, viz., that the damage done was a bite by jaws, with the removal of solid plant material. True bugs, however, have a sucking proboscis and are sap-drainers: usually they are chemically controlled, not by stomach poisons, but by some fluid directed on to their exterior—what is known as a contact insecticide.

The chief pests are the snow-white mealy bugs, the disc-like scales and the aphids or "green-flies." Fortunately they are preyed upon both by larval ladybirds, lace wing flies and the so-called hover flies which are banded somewhat like a wasp and have a metallic sheen. Aphids (*Aphis maidis* Fitch.), are very common on the male (terminal) flowers of maize. The cotton aphid *A. gossypii* Glover sometimes is a pest on dalo leaves.

Pumpkins are often damaged by a large black bug with a red band on its thorax, having a length of 17 to 20 mm.; this evil-smelling insect is *Leptoglossus australis* F. Somewhat larger and stouter and marked with a buff saltire is the crusader bug *Mictis profana* F. which sucks sap from young shoots of roses, Cassia and citrus. The black and yellow wingless nymph may often be seen feeding on the terminal shoot of all these plants whose buds consequently fail to develop.

Lygus muiri Poppius is an orange-brown insect about one-sixth of an inch long and injures young leaves of brinjal, (baigon or egg-plant) which may be severely stunted as a result of the attacks.

Nezara viridula L.—A bright green bug ½ inch long with a triangular shield. Chiefly a pest of tomatoes and beans but with a long list of host plants. Insecticides are almost useless against adults and control measures are to collect fresh egg-masses from the lower surface of leaves, forward them to the Entomologist who will have them parasitised by the "wasp" *Microphanurus basalis* Woll. and return them to the sender for liberation of a new generation of parasites. All old tomato and bean plants should be uprooted as they provide cover for the insect in which it breeds.

Control.—For all of these insects the following standard spray should meet the occasion:—

> Dissolve two ounces of shredded soft soap in 1 quart of boiling water. Remove from fire and add two quarts of kerosene. Churn with a pump into a creamy solution till there is no free oil left.

This mixture is the stock solution which just prior to spraying should be diluted with 9 times its volume of water. If any free oil appears, more soap must be added till it disappears after further churning. To save the inconvenience of preparing the above solution the use of 1 part of White Spraying Oil to 40 parts of water is recommended. The cost of 6s. 10d. per one gallon tin is economical in view of the concentrated nature of the insecticide and the amount of time saved.

5. FLIES.

The main fly pests on garden plants are the fruit-flies which may be controlled by spraying 1 oz. of sodium silicofluoride or fluosilicate dissolved with 2 lb of white sugar in ½ gallon of hot water and diluted with 3½ gallons of cold water. In small gardens, bagging with cheap calico is economical for grenadillas, while the Queensland lure (one tablespoonful of ammonia, one teaspoonful of vanilla essence dissolved in three breakfast cups of water) in conjunction with glass traps forms an additional line of defence. The solution should be renewed once a week and the dead flies removed.

Leaf-mines in maize are caused by larvæ of the small fly *Phytomyza spicata* Mall. and although parasitised may be severe enough to require spraying with nicotine sulphate or Black Leaf 40 at the rate of 1 teaspoonful to 1 gallon of water. This is also useful against *Liriomyza pusilla* Meig., the leaf-miner of cabbage and cauliflower.

In rotten fruit one finds the "ripe rot flies" (*Drosophila* spp.) but these, with other flies found in decaying vegetation, are secondary pests attracted to plant matter after decay has already begun.

6. ANTS.

Ants may be a pest by attacking very young seedlings, nesting in plants or by protecting and encouraging aphids and mealy bugs. A kerosene emulsion spray is effective usually for those on plants, while carbon disulphide should be poured into the burrows.

A useful but poisonous solution consisting of the following two separate solutions is a good slow poison which is taken back to the nest by the workers and fed to the community which thereby perishes:—

Granulated sugar	1 lb	Bring to the boil in a pint of water.
Tartaric acid	1 gramme	
Honey	½ lb	

Dissolve ⅛ oz. (3½ grams) of sodium arsenite in an ounce (2 tablespoonfuls) of boiling water. When cool, add the second solution to the first one and stir well. Soak fragments of a sponge in it and place away from pets, poultry and children. As this requires accurate weighing it is best made up by a pharmacist.

This concludes the account of the more usual harmful insects found in gardens but for the sake of completeness some non-insect pests are mentioned with their control measures.

7. MITES OR "RED SPIDERS."

Only one mite is common in gardens and this is *Eriophyes hibisci* Nal., found chiefly on Hibiscus leaves which are yellowed and puckered. Finely-powdered ground sulphur is better than flowers of sulphur as a dust and should be shaken from an old pepper pot or otherwise evenly dusted on the leaves when wet with morning dew. Severe attacks need a spray of an ounce of flowers of sulphur and 2 oz. of soft soap dissolved in a gallon of water.

8. LAND CRABS.

The land crab or "lairo" does much injury to plants by night. The simplest method is to pour a dessertspoonful of carbon bi- (or di-) sulphide into each main burrow and plug with mud.

Another poison can be made by three-parts filling a four-gallon kerosene tin with water and adding enough corn meal to permit of stirring the mixture easily. Boil and stir till quite dissolved, one three-inch stick of phosphorus; place in the crab-holes away from poultry. This method was used with some success on Ovalau in 1938.

9. SLUGS.

The old-fashioned way of dusting with fresh air-slaked lime has been replaced by the use of the solid "Meta" fuel used for spirit lamps. Unfortunately, this substance is not stocked in Suva but glowing tributes to its efficacy are being made in many current journals all over the world. Sacks, boards, bricks, flowerpots, cut paw paw leaves, etc., all harbour slugs and so should be moved periodically and the slugs collected.

Heavy applications can also be made on alternate evenings of calcium chloride (chloride of lime) and one part of salt to ten parts of lime. A good repellant is Bordeaux mixture which should be made in two separate solutions as follows:—

Dissolve ½ lb of copper sulphate ("bluestone") in 2½ gallons of water in an earthenware, wooden, glass or copper vessel.

In another vessel of any kind dissolve ½ lb of quick lime, also in 2½ gallons of water.

Just prior to use, pour the two solutions simultaneously in a joint stream through a copra sack or through wire gauze into a tank.

Efforts should be made to stock vegetable gardens with toads, *Bufo marinus*.

10. MILLIPEDES.

These creatures have two pairs of appendages per segment and may be controlled by sprinkling on the soil either 9 parts of sugar to 1 part of dry Paris green or one 2-grain tablet of mercuric chloride dissolved in a pint of water. The poison bran bait for cut-worms will also do. Removal of garden rubbish is important as they breed in it. Seed boxes should be isolated on legs like a food safe.

11. WORMS.

Earthworms were reported from Vanua Levu in 1938 to be damaging the greens of the golf links. Here, as on garden lawns, the idea is to bring them to the surface and collect them; this is accomplished by dissolving 1 lb of corrosive sublimate (mercuric bichloride) in one gallon of boiling water, and adding four more gallons of cold water when cool. Two and a half pints of this solution in 50 gallons of water are to be applied to the turf through a sprinkler. Another way is to scatter 1 lb of lead arsenate to every 100 square feet and water the grass. These amounts are only for large areas such as links.

In the garden, worms aerate the soil but if too numerous in flower-beds, they can be controlled with ½ oz. of corrosive sublimate dissolved in 4 gallons of water. For arsenical poisons it will probably be necessary to sign the Poisons' Book when buying from the local chemist.

This article does not claim to be an exhaustive or final account of all the pests to be found in gardens throughout the islands of the Colony but it is hoped that it does give the most usual and injurious ones and shows the lines on which they should be tackled.

12. GENERAL NOTES ON CONTROL.

Insects should be tackled as soon as they are seen on the crops, not after they have been allowed to thrive. Caterpillars and bugs respectively eat and suck a much greater amount of plant material even when permitted to feed on the plant for only a few days, so treat them like paratroops and go for them as soon as they are noticed.

It is realised that in the wet zone with a rainfall of over 120 inches it is never possible to be sure of a dry period but one can try and spray or dust in apparently settled weather, always avoiding periods of bright sunshine, the evening being the best time.

If you have a sprayer make sure it is washed out thoroughly after use and take care to keep the washer greased: these deteriorate quickly enough in the tropics when stocks can be renewed which is not the case at the moment.

Make sure that leaves which are to be eaten, such as cabbage and lettuce, are washed thoroughly if they have been or may have been sprayed with arsenicals. Outer leaves should be thrown away.

Lastly give the plant the best start and easiest chances by practising clean cultivation—rooting up old plants, burning or burying rubbish and by rotating different crops on the same piece of land.

13. COLLECTING AND PACKING INSECT SPECIMENS.

This section is reprinted from the *Journal* for September 1940: attention is drawn to the paragraphs on ventilation, sufficient packing and non-access of ants, as failure to do this means that the specimens may be useless on arrival.

Planters, and other settlers who live away from the vicinity of Suva and who wish to send to the Department of Agriculture specimens of insects

damaging their crops or garden plants may find the following information of some use. It is hoped that by its means the material sent may arrive at headquarters in the best condition for examination and subsequent report. Any information required will always be gladly supplied.

Live insects, such as caterpillars, require both sufficient food and ventilation. The food-plant should be so packed that there is no chance of water leaking from the receptacle holding it while adequate ventilation can be obtained by boring holes in the box or tin if wire gauze cannot be used. Closed tins without some form of ventilation result in fermentation or condensation and this will spoil the contents. A label with "Live insects, immediate delivery," should be affixed. For very short journeys there is clearly less need to take such precautions.

Delicate insects such as aphids, thrips, lice, ants and small flies should be put in small tubes or bottles of methylated spirits, formalin or alcohol. Harder and more robust insects such as beetles, bees and wasps may be packed in tins with carbolic acid or powdered camphor-balls and fine sawdust or cotton wool to prevent injury.

Butterflies are best sent by placing them within rectangular pieces of smooth paper which have been cross-folded into the shape of a triangle and the overlapping edges turned down. Data can be written on these papers.

Scale insects should be kept on the leaf which is then pressed between blotting paper under a heavy weight.

Large moths, stick-insects and grasshoppers should have their viscera removed with a pair of fine scissors and the abdomen filled with cotton wool or the whole specimen may arrive rotten and putrid.

Attention should also be given to packing as violent jarring may be expected on a journey in small cutters or schooners—corrugated cardboard and "excelsior" or "wood wool" are two of the best substances as shock-absorbers.

While the material is being kept preparatory to shipment it is important to place it out of the reach of ants which in an hour or two may damage the whole collection and make it useless. This precaution is most important.

Accompanying the specimens should be the name of the crop attacked, particulars of the portion so attacked and its age with the date and exact locality. If possible, samples of the damaged tissue should also be sent or a rough sketch if this impossible. Any other information such as abnormal weather, extent and degree of infestation, records, with dates, of previous outbreaks, other host plants and so on should be sent.

A long series of specimens is always desirable and care should be taken to see that immature stages only are not sent.

Lastly, always err on the side of overpacking with "wood wool" or moss.

14. SOME USEFUL MEASURES.

The following rough measures may prove useful in preparing sprays:—

1 teaspoonful = $\frac{1}{8}$ fluid ounce (1 drachm).
1 desertspoonful = $\frac{1}{4}$ fluid ounce (2 drachms).
1 tablespoonful = $\frac{1}{2}$ fluid ounce (4 drachms).
1 wineglass = 2 fluid ounces.
1 drinking glass = 10 fluid ounces ($\frac{1}{2}$ pint).
1 cylindrical cigarette tin = 9 fluid ounces.
1 pint of water weighs a pound and a quarter (20 oz. avoirdupois) and 1 gallon weighs 10 lb.

THE MALARIAL MOSQUITO OF MELANESIA.

By
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THE following article has been prepared in view of the local interest in malaria as shown by a press interview (1) with the Medical Officer of Health which gave rise to an anonymous letter eight days later in the local paper (2). The correspondent stated that in Palestine and Mauritius the *Anopheles* mosquito does not breed in acid water but only in alkaline water. However true this may be it is of little relevancy so far as Fiji is concerned as Anopheline mosquitoes have a very wide variety of requirements suitable for breeding. Thus of the nine Anophelines known from Palestine, two breed in large stagnant marshes, two in smaller marshes and fairly actively flowing ditches, one in mountain torrents, two in rapidly flowing ditches, one in salt water and one in such domestic receptacles as wells, cisterns, buckets, etc.(3). One Mauritius species can also develop in sea water and its eggs survive three days without water. The range in the hydrogen ion concentration, which was mentioned by the correspondent, varies from pH 7·4 to 8·8, one species alone being found in waters between these limits which are from almost neutral to distinctly alkaline. What one wants to consider in Fiji, however, are not facts from 18 year old reports on Mauritius and Palestine but facts about the malarial mosquito of Melanesia found in the Solomons and New Hebrides, this is *Anophcles punctulatus* Dönitz and no other species occurs. Some three years ago an Australian periodical with a wide circulation in the South Seas actually published without editorial comment a letter (4) from a Vanua Levu correspondent stating that *Anopheles* was then " quite common " in Fiji. This statement was subsequently refuted (5) by the writer and so need not be referred to further here.

Let us therefore consider what breeding sites have been recorded for *A. punctulatus* in this region, starting from the west. In Papua larvae have been taken in seepage, running grass-covered plantation drains and in beached canoes; in New Britain, temporary rain pools, small depressions and roadside puddles. Coming to the Solomons, records are more numerous and comprise small temporary collections of water as in hoof marks and other shallow ground cavities (6), tins (7), pools, brackish swamps (8), rock hollows and tree rot holes (9) the last only twice recorded. In the New Hebrides, taro (dalo) swamps, sluggish surface water, a drinking hole, dammed up stream and a hot spring (100° F.) near the beach are all recorded by Buxton (10). Despite the paucity of records of domestic breeding it is clear that it can breed in tins and so would thrive in urban areas.

These records show that the types of water chosen by the female mosquito for egg-laying can all easily be found in Fiji, including even the hot springs so well known at Savusavu and elsewhere along the south coast of Vanua Levu. The writer was an eye witness for several years of the intense effort needed to keep the southern cleared end of Tulagi free from mosquitoes necessitating a weekly oiling of all water with Diesel fuel oil plus clearing bush by a squad of six or eight prisoners. Grass-grown drains and small puddles seem to be the favoured sites and these require constant treatment in order to stop breeding of mosquitoes.

The malarial mosquito can easily be recognized by its grey body, spotted wings and by the angle its body makes with any surface on which it alights. The writer would welcome any specimens of doubtful mosquitoes which seem to fulfil these requirements.

The distribution of *A. punctulatus* in Melanesia is interesting as it is practically confined to the area eastwards of 170° E. and north of 20° S.; inside

this area the only place known to be free is Belep north of New Caledonia, while Aneityum just south of 20°S. is malarial. Futuna (not to be confused with the Futuna south of Wallis Island) just outside the area is the only malaria-free island in the New Hebrides. Lambert [11] states that malaria is absent from nearly all the Polynesian atolls in Melanesia but this is now no longer correct as both Ongtong Java and Sikaiana (Stewart Island), two typical coral atolls, have malaria.

In Sikaiana and Rennell it is possible to date the arrival of *Anopheles* and malaria as respectively between the years 1921 and 1933 and 1933 and 1937, eloquent testimony in Melanesia to the futility of the belief that if an island is able to support this mosquito it would have arrived there previously. Readers of Dr. Lambert's book [12] will find in Part III all the proof needed of the results of the recent arrival of malaria in both Sikaiana and Rennell. Another instance of tropical islands formerly free from malaria, but which subsequently became infested, are Barbados in 1927, where the mosquito was probably carried in holds of schooners [13] from adjacent West Indian ports where malaria flourished and Mauritius where over 31,700 persons died from malaria in 1867 (over 18,000 in the capital alone), following arrival of the mosquito at the end of the previous year [14]. If any further details are required of the possibilities of the entry of the mosquito into Fiji let us conclude with Buxton's remark [10]:—"*Anopheles punctulatus* is not a specialist in its breeding places and it would easily establish itself in Fiji or Samoa". As the chief form of malaria in the Solomons is the malignant tertian, the importance of care in this connexion is self evident.

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SALT MAKING BY FIJIANS.

By
W. L. PARHAM.

A SURVIVING native industry somewhat stimulated by war conditions is the making of salt. For reasons to be discussed later this has been of importance always in native life but when stores began to refuse to sell salt in any quantity to any but regular customers the native-made salt became important to many.

The making of salt appears to be a dry zone industry and is now to be observed all along the northerly coast of Viti Levu from the Sigatoka River to Tailevu Point. Both coastal and some inland natives build temporary shelters at favoured spots, even on the salt-marshes themselves, such living conditions would be intolerable in the wet zone. There is evidence also that the people seek sea-water with an increased salt content owing to

natural evaporation, and the frequent showers of the wet zone would be an interference. The free salt to be seen on the tidal flats of Raviravi for instance are not a feature of the wet zone coasts.

The natives do not favour water direct from the sea but on tidal flats bare of mangrove they dig brine pits (mati) which are walled around to prevent the entrance of surface water. The obvious reasons for utilizing only water that has seeped into these pits is its freedom from floating refuse and the convenience of baling water from the pits during low tide. It is possible also that evaporation takes place in the pits as the natives say that it takes far less time to boil off the water when taken from the pits than when taken from the open sea. They say also that salt from water from the open sea is whiter but flakier than that from the pits. The siting of the pits also gives salt of varying whiteness.

The actual process consists in boiling the water, formerly in native pots, but nowadays in biscuit-tins or other metal containers. The resulting salt is shaped into cylinders and wrapped in ivi leaves and bound with strips from mangrove roots. There is an illustration of such cylinders of salt opposite page 137 of the *Handbook of Fiji*, 1937 edition, which shows both a man and a woman carrying salt and such a sight is common on all the old customary trade routes of the Fijians. The exchanges of salt and articles of native manufacture is an old-time custom and is usually associated with ceremonial visits. For instance the little known tracks through the interior of Viti Levu are kept open by the organized transport of salt from the Sigatoka and Nadi coast to the Wainimala and Waidina rivers. The fixed load for a woman is one cylinder of salt and two native pots. One trail leads from Naduta koro in Colo West to Nasauvere in Colo East. Special elongated earthen pots are manufactured at Naduta and the nearby koro of Nakoro and appear to be shaped for convenient carrying on women's backs. The salt taken by these " caravans " is distributed over most of Colo East, the journey over the mountains is so difficult that the natives usually take two or three days. That the women do the carrying is not evidence of the laziness of the men who are well occupied building shelters for each night and hunting for food.

An interesting indication of the ceremonial value of native-made salt is that cylinders of salt were amongst the gifts to visitors at the Council of Chiefs held at Sigatoka in September.

Probably a reason for the continuing popularity of the native-made salt amongst Fijians is the convenience of the hard cylinders for hanging close to cooking fires so that containers are not needed; the salt is scraped off the cylinder as needed.

COPRA SHIPMENTS.

THE following tabulated summary of copra shipments with costs and returns made by the Fiji Copra Board to the end of September will be of general interest to planters and merchants. It should be noted that secretarial expenses, for which 2s. 6d. per ton is allowed, have not been included in the charges as shown. All copra purchased under the Government purchase scheme has been included but not copra requisitioned by Government at the time the scheme came into operation as the accounts for such copra have not yet been closed.

TABLE 1.—PURCHASE WEIGHTS, SHIPMENT WEIGHTS, AND SHRINKAGE.

Shipment Number.	Purchase Weights.		Shipped Weights.		Shrinkage per cent.	
	P.	F.M.S.	P.	F.M.S.	P.	F.M.S.
	Tons.	Tons.	Tons.	Tons.	Per cent.	Per cent.
Suva—						
No. 1	703	894	690	880	1·8	1·7
No. 2	191	13	187	13	1·8	0·8
No. 3	524	153	520	151	0·7	1·5
No. 4	284	85	280	84	1·2	1·9
No. 5	1,219	369	1,197	358	1·8	2·3
Total ..	2,921	1,514	2,874	1,486	1·6	1·8
Levuka—						
No. 1	265	1,122	257	1,075	3·0	4·2
No. 4	127	628	124	612	2·3	2·5
No. 5	217	1,364	214	1,342	1·2	1·6
Total ..	609	3,114	595	3,029	2·3	2·7
Total: Suva & Levuka	3,530	4,628	3,469	4,515	1·7	2·4

Total tonnage purchased, both grades .. .. 8,158 tons.
Total tonnage shipped, both grades .. .. 7,894 ,,
Overall shrinkage .. .. 2·1 per cent.

TABLE 2.—COSTS AND RETURNS.

Shipment Number.	Purchase Cost.	Charges.		Total cost f.o.b.	Realization.	Surplus.	
		Total.	Per ton purchased.			Total.	Per ton purchased.
No. 1 ..	£44,984	£4,652	£1 11 2	£49,636	£52,472	£2,836	£0 19 0
No. 2 ..	3,192	290	1 8 5	3,482	3,647	165	0 16 2
No. 3 ..	10,508	648	0 19 2	11,156	12,202	1,046	1 10 10
No. 4 ..	17,136	1,738	1 10 11	18,874	19,904	1,030	0 18 3
No. 5 ..	48,845	4,813	1 10 4	53,658	56,469	2,811	0 17 8
Total ..	£124,665	£12,141	£1 9 9	£136,806	£144,694	£7,888	£0 19 4

NOTE.—Charges and surplus vary according to conditions of shipment, e.g. Shipment No. 2 was made up almost entirely of Plantation grade, on which there is a considerably smaller margin, consequently the surplus was small. Shipment No. 3 was made in bags the cost of which was charged to the purchaser. No allowance for wastage of bags was therefore required under charges. The margin of realization over total costs continues to be wide as deliveries of Plantation grade have been less than was anticipated.

While the quality of our copra has shown some improvement due to grading, a recent telegram from the Ministry of Food has strongly stressed the urgent need for further improvement.

Hence, it is hoped that more attention will be paid to this important matter which depends largely on undelayed, uninterrupted and adequate drying.

—C.H.

SURVEY OF INDIAN FARMERS IN THE CENTRAL DISTRICT.

By
C. HARVEY, B.Sc. (Agr.), A.I.C.T.A.,
Senior Agricultural Officer.

In late 1939 and early 1940 a survey was carried out of Indian farmers (non-cane growers) in the Ra, Tavua, and Ba sub-districts with a view to collecting information as to the size of farm, type of farming carried out and relative efficiency of the different sizes and types of farms. Unfortunately pressure of work connected with the war effort caused the survey to be abandoned; it was possible only to measure crop acreages during the one period of the year only and a second visit to each farm to note the succession of crops could not be made. The information presented is also incomplete in other respects, but some points of interest emerge from a study of the tables given below.

The collection of field data was undertaken by Mr. J. J. C. Suckling, Agricultural Assistant, and Indian Field Assistant Sant Ram, to whom acknowledgment is made.

It will be seen from Table 1 that more than half the total number of holdings fall into Class 1, i.e. holdings up to 10 acres in size, while approximately 80 per cent were of 20 acres or less. Data as to form of tenure is incomplete and is not shown, but included freeholds, Crown and Native leases, sub-leases and a number of irregular tenancies.

It will be seen from Table 2 that the total area under cultivation increases with the size of the farm, but not proportionately. The smaller holdings are generally situated in more favoured localities in respect to soil and water, and the larger holdings include a large proportion of uncultivable rough grazing. The area cultivated per head also increases with size of farm, possibly due to more adequate provision of implements and draught animals on the larger holdings. The area of uncultivated or fallow land available on holdings of 10 acres or less is small in consideration of requirements for the depasturing of working bullocks and other stock and for resting the arable land.

Table 3 shows, as would be expected, that nearly every Indian farmer grows rice. The acreage under this crop per family and per head is appreciably less for holdings up to 10 acres than for larger holdings. A point of interest is that mixed plantings (i.e. padi interplanted with maize, pigeon pea, dhall arhar or other crop or crops) which is common in Ba, is less popular in Tavua and apparently is not practised at all in Ra. Pigeon pea is widely planted in Ba (see Table 4) and is often interplanted with rice; this legume is planted in the young padi and remains as a pure stand after the padi is harvested.

From Table 4 it will be seen that fewer farmers on holdings of 10 acres and under have pulse crops as compared with those on larger holdings. The proportion of farmers growing pulse crops in Ra is also small as compared with Ba and Tavua, but a survey later in the season might show an annual pulse crop to be included in the rotation. Pigeon pea is very generally grown in Ba, less so in Tavua, and only occasionally in Ra.

The principal point of interest in Table 5 is the comparatively small proportion of Indian farmers who include native root crops—tapioca and kumalas—in their plantings, and the very small area, less than a chain, planted by those who grow these crops at all. Tapioca especially is a valuable stand-by in these dry districts where the rice crop is liable to partial or complete failure from drought, and it is to be hoped that since the time when this survey was undertaken the farmers concerned will have taken the advice constantly given that each family should undertake successive small

plantings of root crops as an insurance against the failure of the rice crop or of imported foods. It is also noteworthy that the proportion of those who have permanently improved their holdings by the planting of coconuts and fruit trees rises with the size of the holding. This is probably associated with the fact that very many of the holdings of 10 acres and less are annual tenancies, which form of tenure is not conducive to the establishment of permanent improvements in any form.

Table 6 shows the ownership of various classes of livestock, which increases with the size of holding as is to be expected. Four out of five of the farmers even on the smallest holdings own working bullocks, and two to three out of four own milch cows. Available pasture in the smallest class of holding is insufficient and in the majority of cases the stock have to be herded off the farm for much of the time.

It is hoped to continue such surveys when the field staff can return to normal duties. The information so far obtained is insufficient to allow of definite conclusions being reached, but there is a strong indication that, in this type of country, holdings of under 10 acres are too small to allow the best and most productive use of land and labour, except possibly in very restricted localities of high soil fertility, and that 10 to 20 acres is the optimum size of family holding.

TABLE 1.—SIZE OF FARMS.

District.	Total No. of Farms.	Class I up to 10 acres.	Class II 10–20 acres.	Class III 20–50 acres.	Class IV over 50 acres.
Ra	258	140	42	33	43
		54%	16·5%	13%	16·5%
Ba	223	138	44	29	12
		62%	20%	13%	5%
Tavua	143	101	18	13	11
		71%	12%	9%	8%
Total ..	624	379	104	75	66
		61%	17%	12%	10%

TABLE 2.—ACREAGE CULTIVATED. AVERAGES FOR CLASSES IN EACH SUB-DISTRICT.

	Number of persons on holding.	Size of holding.	Total area under cultivation.	Area cultivated per head.	Uncultivated or fallow.
Class I.—		Acres.	Acres.	Acres.	Acres.
Up to 10 acres—					
Ra	4·9	5·5	3·0	·62	2·5
Ba	6·1	5·5	3·1	·51	2·4
Tavua . ..	5·7	5·0	3·5	·61	1·5
Class II—					
10–20 acres—					
Ra	7·4	15·2	5·5	·75	9·7
Ba	8·2	14·8	6·0	·73	8·8
Tavua . ..	7·8	15·2	5·5	·71	9·7
Class III—					
20–50 acres—					
Ra	7·2	36·9	4·8	·66	32·1
Ba	9·3	30·2	9·4	1·01	20·8
Tavua . ..	6·7	33·4	5·6	·84	27·8
Class IV—					
Over 50 acres—					
Ra	7·5	175	6·2	·82	168
Ba	13·3	167	12·1	·68	154
Tavua . ..	8·3	156	7·6	·92	148

TABLE 3.—RICE PLANTINGS. AVERAGES FOR CLASSES IN EACH SUB-DISTRICT.

	Rice: pure crop.		Rice: mixed crop.		Per cent of class growing rice pure or mixed.	Area per head in family pure plus mixed.
	Per cent of class planting as pure crop.	Area per family.	Per cent of class planting as mixed crop.	Area per family.		
Class I—		Acres.		Acres.		
up to 10 acres—						
Ra	98	2·5	..	..	98	·51
Ba	83	1·5	47	1·0	99	·41
Tavua ..	87	2·5	16	·3	97	·48
Class II—						
10–20 acres—						
Ra	98	4·4	..	..	98	·60
Ba	93	3·0	38	1·4	100	·53
Tavua ..	89	3·0	22	·7	94	·48
Class III—						
20–50 acres—						
Ra	97	4·8	..	..	97	·63
Ba	90	2·6	72	4·7	100	·78
Tavua ..	100	3·8	8	·1	100	·57
Class IV—						
over 50 acres—						
Ra	93	4·5	..	..	93	·60
Ba	100	4·9	42	1·8	100	·50
Tavua ..	91	4·8	9	·1	91	·59

TABLE 4.—LEGUMES. AVERAGE FOR CLASSES IN EACH SUB-DISTRICT.

	Legume: Pure Crop.		Legume: Mixed Crop.		Per cent of class growing legume mixed or pure.
	Per cent of class planting as pure crop.	Area per family.	Per cent of class planting as mixed crop.	Area per family.	
Class I—		Acres.		Acres.	
up to 10 acres—					
Ra	18	·15	..	..	18
Ba	33	·26	52	1·00	72
Tavua ..	29	·24	20	·38	45
Class II—					
10–20 acres—					
Ra	31	·25	..	..	31
Ba	68	·73	52	1·78	82
Tavua ..	56	·49	33	·92	78
Class III—					
20–50 acres—					
Ra	24	·16	..	..	24
Ba	59	·73	76	4·80	90
Tavua ..	69	·88	15	·15	85
Class IV—					
over 50 acres—					
Ra	46	·60	..	..	46
Ba	50	1·75	42	1·86	75
Tavua ..	55	1·09	9	·36	64

TABLE 5.—MAIZE, NATIVE ROOT CROPS AND PERMANENT CROPS. AVERAGE FOR CLASSES IN EACH SUB-DISTRICT.

	Per cent of class planting maize pure or mixed.	Area of pure maize per family.	Area of mixed maize per family.	Per cent of class growing native roots.	Area of native roots per family.	Per cent of class with coconut or fruit trees.
		Acres.	Acres.			
Class I— up to 10 acres—						
Ra	35	·30	..	26	·05	7
Ba	41	·20	·55	15	·02	29
Tavua ..	38	·35	·14	6	·02	4
Class II— 10–20 acres—						
Ra	57	·81	..	36	·07	26
Ba	59	·42	1·16	26	·05	27
Tavua ..	89	·92	·72	17	·05	30
Class III— 20–50 acres—						
Ra	15	·11	..	48	·11	27
Ba	55	·29	2·4	45	·05	66
Tavua ..	61	·69	·08	8	·04	31
Class IV— over 50 acres—						
Ra	60	·90	..	49	·10	51
Ba	50	·33	1·42	25	·07	75
Tavua ..	73	1·4	·27	18	·02	45

TABLE 6.—LIVESTOCK.

	Percentage Owning.				Average number per Family.			
	Bullocks.	Cows.	Horses.	Goats.	Bullocks.	Cows.	Horses.	Goats.
Class I— up to 10 acres—								
Ra	83	53	34	19	2·1	·9	·7	·8
Ba	80	72	66	25	1·9	1·5	1·6	2·1
Tavua ..	85	75	49	20	2·2	1·7	1·2	2·5
Class II— 10–20 acres—								
Ra	88	76	57	40	2·7	1·4	1·3	1·5
Ba	93	86	86	27	3·0	3·7	4·9	5·4
Tavua ..	100	89	67	56	3·6	1·9	2·4	5·2
Class III— 20–50 acres—								
Ra	100	88	61	49	3·3	3·6	2·0	4·4
Ba	90	86	86	24	3·0	2·6	3·1	4·3
Tavua ..	100	77	77	31	3·8	2·3	2·3	3·7
Class IV— over 50 acres—								
Ra	95	91	86	51	4·2	5·4	5·4	17·2
Ba	92	92	75	67	3·6	5·7	13·6	27·7
Tavua ..	91	100	91	73	3·5	5·7	7·4	45·7

VAIVAI (*Leucæna glauca*) AS A FEED.

"Vaivai," which is a common weed in the dry zones of Viti Levu and elsewhere, is utilized extensively in Hawaii as a cattle feed, where it is said to yield as much as 25 tons of green fodder per acre per annum, equivalent to 7 tons of air-dry fodder.

On a green weight basis this contains 6·62 per cent protein, 16·25 per cent total digestible nutrients and a nutritive ratio of 2·57 compared with 3·32 for alfalfa. The total yield of protein per acre is 2,760 lb which would be equivalent to 3 tons of soya bean meal per acre. Consequently "vaivai" appears to be a very attractive fodder crop from the standpoint of economy of production.

Animals relish the feed which may be chopped and fed daily in fresh condition, ensiled or dried, ground and fed as a meal.

As ensilage, it should be chopped, mixed with 5 per cent of molasses and well packed.

It should not, however, be fed to horses or pigs as it causes the falling of hairs from their tails.

(Extract from letter of J. C. Ripperton, Agronomist, University of Hawaii, dated 28th September, 1942, and received through Sir Maynard Hedstrom.)

—H.W.J.

REVIEWS AND EXTRACTS.

2. TUNG OIL.

This article summarises experience of Tung Oil trees (*Aleurites fordii* Hemsl.) in Western Australia up to 1938.

Many experimental plantings made, little success achieved. During 1937, 60,000 trees imported from New South Wales. A number of small plantations established on great variety of soils—gravels, sandy loams, good orchard land. Trees generally made poor growth.

Different varieties of habit observed at different centres, and only at Byford were trees found, situated on banks of small streams, that conformed to growth of tree in natural habitat.

Advice that trees would grow anywhere, found to be wrong. Experiments in hand to ascertain fertilizer requirement, effect of sound cultural practise, to select and propogate desirable types of trees as extreme variation exists in habit of growth, yields, proportion of kernel to shell, and oil content.

No commercially profitable plantations in Western Australia, and doubtful if any occur outside of China, which have reached profitable development.

United States of America had planted by 1940, 175,000 acres, mainly around the Gulf of Mexico, in average rainfall of 50 inches to 60 inches.

Dr. Ashley's survey (*Bull. Imp. Institute*, Vol. 38, No. 1, 1940): states, *inter alia*:—

". . . Mature trees at Gainesville University show average yield of nuts from 10 trees, over 13 year period (9th–21st year) = 22·7 lb.

Individual trees gave from 4·7–67·3 lb, while the heaviest cropper gave 90 lb or over, the record being 164·8 lb. In the field average yields about 10 lb per tree, say 500–600 lb per acre, under usual spacings, yield considered good in large areas, even when frost damage is slight, but under present conditions growers can hardly expect to maintain this figure."

Five hundred pounds of nuts = 190 lb of oil approximately.

At Tung Oil Mills Ltd., Sydney, nuts purchased on profit-sharing basis, growers receive minimum of 4d. per lb for entire nuts at factory plus 50 per cent of net surplus on realization.

In practice grower received 50–55 per cent of value of oil; pre-war price £90 per ton = 9½d. per lb, 190 lb of oil per acre = £3 19s. 2d. at Coy. Mills, Sydney.

Present price (1941) value doubled, return is £8 per acre, approximately.

It is obvious that unless yields can be built to a much higher figure than quoted little can be expended on maintenance of plantation.

Under such conditions it is yet to be proved that yields approximating 190 lb of oil per acre will be produced. —H.W.J.

—Powell, H. R. In *Journal of Agriculture*. W. Australia, Sept., 1941.

3. FUTURE OF THE UNITED KINGDOM MILK INDUSTRY.

The future of the milk industry in Great Britain is the key to two matters of extraordinary national importance. Its future is, by and large, the future of national nutrition; its future is, no less, the future of British farming. An expanding milk industry is our best guarantee of a steady improvement in the health and physique of the rising generation; a declining milk industry would forshadow the rapid re-entry of British farming into the Slough of Despond.

The milk industry includes what is, in terms of money value, nutritional significance and numbers engaged, the greatest of our agricultural enterprises. Technically, administratively and educationally, this large industry (dairying, processing and distribution of milk) must in the future be regarded as one unit—apart from the cheese, butter, ice cream and cattle feeding trades.

The major half of agriculture is forethought and planning several years ahead, and a planned system must have objectives which in the milk industry are: (*a*) production and distribution in the highest quantity and quality of a key foodstuff that is essential in certain stages of human life and of major value at any stage and (*b*) to provide a reasonable living for those engaged in the industry.

It is assumed that any future Government of Britain will insist on the steady improvement of the health and physique of the people, particularly of the rising generation and the promotion of British agriculture. Milk is essential to both these objects.

In Britain it is admitted that 0·8 of a pint of milk per head of the population is necessary for the adequate nutrition of the people and that at present only half this quantity of milk is consumed. Calculations show that 140 million gallons of milk per month throughout the year would be necessary to supply Britain's needs, and this means that winter production must be increased by 75 per cent and summer production by 30 per cent without making any allowances for milk required for manufacture.

Hence the future of dairying in Britain should be well assured but to increase production increased efficiency is essential. Thus production per cow should be capable of very considerable increase by better breeding, intensive feeding, better control of diseases, increase of cow population, the use of proved licensed sires only, better grassland management and the large scale adoption of milk recording—the 700 gallon cow is more efficient than the 500 gallon cow per unit of feeding stuff consumed.

Larger dairy units will also tend to greater efficiency in every way under wise management—lower unit costs, greater cleanliness and better quality.

In distribution, efficiency can be much improved by more attention to cooling, to reduction of delay in transport, to grading, to pasteurization, to cleanliness of empties, etc.

Finally, the scope for soundly conducted experimental research in dairy husbandry, physiology of the cow, production, handling, processing of milk, etc., is immense and, combined with farm education, must, in the future, be given the attention it merits if the dairy industry is to prosper continuously.

—H.W.J.

—Professor H. D. Kay, O.B.E., in *Nature*, No. 3793, 11th July, 1942.

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4. SOIL EROSION.

Mr. G. V. Jacks, Deputy Director of the Imperial Bureau of Social Science, pointed out that, during the last century, new settlement had always resulted in a depletion of soil fertility. But recent settlement had caused particularly rapid soil exhaustion, partly because of agricultural progress which enabled more efficient exploitation of the soil. First, yields declined, then the soil began to disappear, washed away by water or blown away by wind. Enormous areas in North America, Africa and Australia were now barren wastes. The wastage of land was not yet serious for the world as a whole, but was becoming serious in some countries. If erosion increased at present rates, the U.S. might be incapable of organized existence by the end of the century, and this might happen even sooner in Africa.

Erosion was a warning of the lack of harmony between human society and its environment. Systems of agriculture were practised which were unsuitable for the soil. The New World and the tropics were colonized by European agriculturists on methods and on social forms suited only to Europe. The first stage of settlement was that of destructive agriculture, and if continued long enough settlement might have to be terminated altogether. The alternative was the second stage of constructive agriculture, restoring soil fertility to a new high level.

Unrestricted ownership of virgin land was bound to be destructive, because of exploitation of the soil for private profit. In all countries, export agriculture had resulted in soil erosion. Soil saving grass was replacing soil-exhausting arable crops as in fifteenth century England. This could not be done in America by subsidized competition between individual farmers, so that co-operation was beginning to develop. Farming communities, known as soil conservation districts, were built up, with elected leaders possessing legal authority, deciding how all the land of the district should be worked. In the past five years these districts had sprung up spontaneously all over the United States, and had met with dramatic success.

This revolution had not resulted from a recognition of disasters ahead, but from the failure of export markets. In parts of Africa disasters were imminent, and were recognized by the authorities; but as long as crops were sold abroad, nothing would be done.

To abandon the "export complex" meant jettisoning the economic base of Colonial development; but the future trend must be towards more self-contained economy. European civilization did not fit in with the conservation of African soil. The war might have offered the opportunity to develop a self-sufficient agriculture. Local production was being encouraged. We could not be certain that African land would benefit from self-sufficient

agriculture, though there was reason to believe that self-contained agriculture could always, and export agriculture could never, be made to conserve soil fertility.

The spread of soil-saving agriculture in the United States was largely due to accompanying social trend away from individualism towards communal responsibility. Some corresponding change was required in the tropics, and it would involve recognition that human society, in its relation to the land, was indivisible into Black and White. At present, the Whites had to exploit the land in order to maintain their superiority over the Blacks, and the Blacks had to exploit it in order to exist at all in competition with the Whites. A common base was now needed and the new society would be something specific to the African environment.

(Conference arranged by the Colonial Bureau of the Fabian Society, Oxford.) *Crown Colonist*, November, 1941.

OBITUARY.

Mr. W. L. Parham.

It is with great regret that the sudden death on 13th November, 1942, of Wilfred Laurier Parham of the Department of Agriculture is recorded.

Born in South Africa on 18th March, 1900, and with some twenty years of Fijian experience, Mr. Parham possessed a deep and accurate knowledge of natural life in Fiji, especially of native agricultural practices and the native flora, many of his observations thereon being recorded in the pages of this *Journal* from time to time. He joined the Department in June 1930, being first stationed at Sigatoka and subsequently at Tailevu where he developed the Waimaro Settlement Scheme.

His unusual knowledge of the history and customs of people of the country and his comprehensive grasp of the Fijian language coupled with his extreme patience in dealing with Fijians gave him an intimate and exceptional insight into native character which enabled him to gain the willing co-operation of the rural Fijians in many of his schemes for improving their standards of agriculture.

His conscientious, patently honest and continuous efforts on behalf of the Fijian established their confidence in him and endeared him to all with whom he came into contact in the course of his varied duties which he always discharged with energy and enthusiasm.

He was keenly interested in the settlement of Fijians as farmers on their own lands and his marked success in this important part of his exemplary service will long stand as a fitting memorial to his steady devotion to duty.

Personally he was always most unassuming and ever ready to expend his tireless energy in rendering assistance to all requiring it—Fijian and European alike. He was deeply attached to his family and sincere sympathy is felt for his bereaved wife and two little children as well as for his mother and her family.

—H.W.J.

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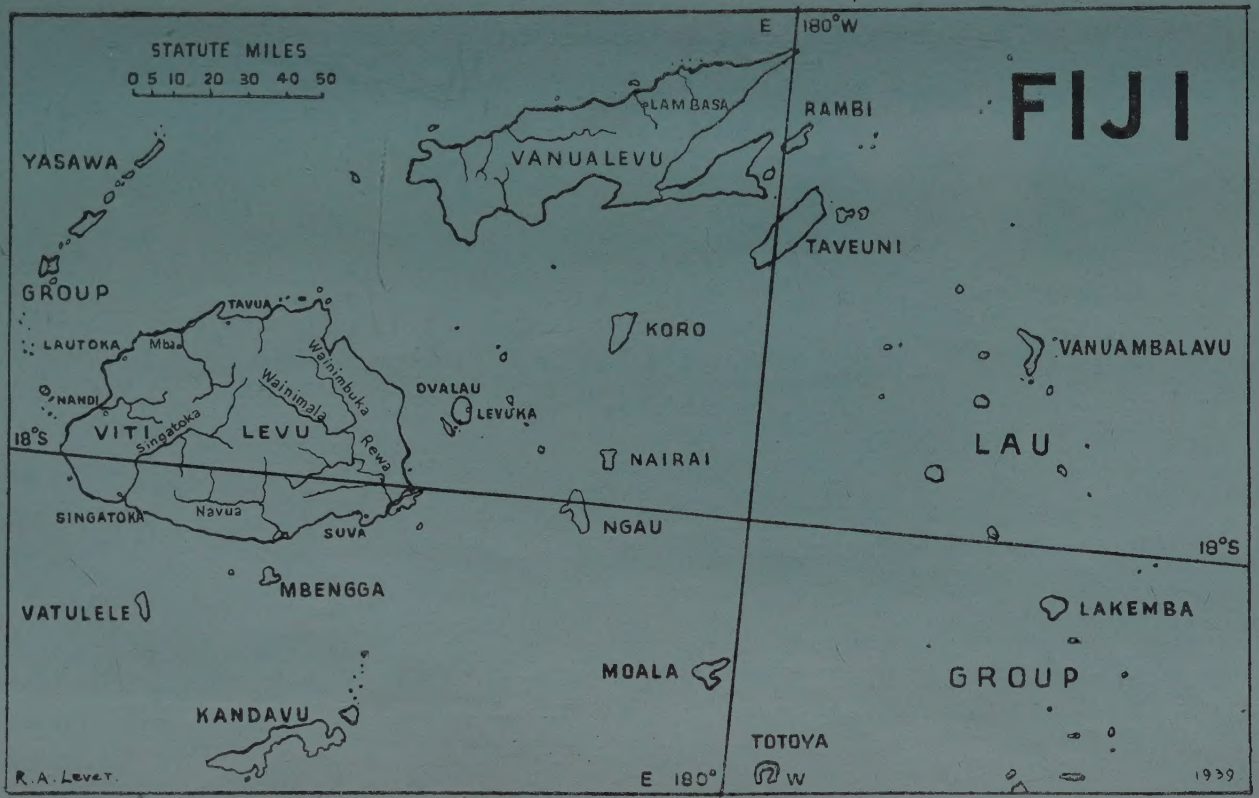
—R. J. A. W. L.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